Observations of a Small Population of Estuarine-Inhabiting Alligators Near Southport, North Carolina

WILLIAM S. BIRKHEAD

Division of Science and Mathematics, Columbus College, Columbus, Georgia 31993

AND

CHARLES R. BENNETT

National Marine Fisheries Service, Environmental Assessment Branch, Portland, Oregon 97208

ABSTRACT.— Field observations of the American Alligator, *Alligator mississippiensis,* were made incidental to a five-year study of the nursery use of Dutchman Creek estuary near Southport, North Carolina, by estuarine dependent fishes and shell fishes. Alligators were most frequently seen between April and July and occurred over a wide range of salinities. Some individuals that inhabited the lower reaches of the estuary appeared to have shifted their distribution in response to a major alteration of this habitat. After the headwaters and principal tributaries of Dutchman Creek were bisected by the discharge canal of a nuclear power plant, alligators appeared to move out of the creek and into the lower reaches of its severed tributaries adjacent to a drainage canal that received their diverted flow.

INTRODUCTION

Numerous sightings of alligators were made incidental to a five-year study of Dutchman Creek estuary, a tidal creek and salt marsh habitat located approximately 2 km west of Southport, Brunswick County, North Carolina (Birkhead et al. 1977). Since the alligator is an endangered species, and so little is known about the biology of northern populations, we felt that these observations were of interest. The fact that the habitat involved underwent a pronounced change after our study began made the situation even more interesting.

In its unaltered state, most of the freshwater flow into Dutchman Creek came from its headwaters and from three principal tributaries to the north and west. Tidal water flushed in and out twice a day by entering the creek from the Intracoastal Waterway, which bisected its lower reaches. Thus, a typical estuarine condition was established, with a salinity gradient ranging from an average of approximately 2 ppt in the upper reaches to an average of 20 ppt near its mouth (Birkhead et al. 1977). Marshes adjacent to the lower reaches of the creek and tributaries are flooded regularly with the tides. *Spartina alterniflora* is the dominant vegetation in these areas. As ground elevation increases slightly in the upper reaches of the estuary, the regularly flooded marsh grades into irregularly flooded marsh dominated by *Juncus roemerianus* (Seneca et al. 1976).

Carolina Power and Light Company began constructing a nuclear-fueled, steam electric generating plant just north of Southport approximately two years before our study began. This facility was designed to employ a once-through cooling system. The discharge canal for the cooling system was constructed during the summer and fall of 1972, along the northwestern and western edge of the salt marsh bordering Dutchman Creek. This was between 9 and 16 months after our study began. Freshwater runoff from the upper reaches of the bisected tributaries and headwaters of Dutchman Creek was diverted into a drainage canal dredged adjacent to the discharge canal (Fig. 1). The drainage canal emptied into the Intracoastal Waterway approximately 1.5 km west of the mouth of Dutchman Creek. Although the hydrographic regime of the lower reaches of the Dutchman Creek estuary was not appreciably affected by the diversion of the freshwater input, salinity increases of between 13 and 15 ppt were recorded in the upper reaches of the estuary below the canal right-of-way and at the mouths of the severed headwaters and tributaries above these canals (Birkhead et al. 1977).

The primary purpose of this paper is to denote the distribution of alligators within the Dutchman Creek estuary before, during, and after its alteration.

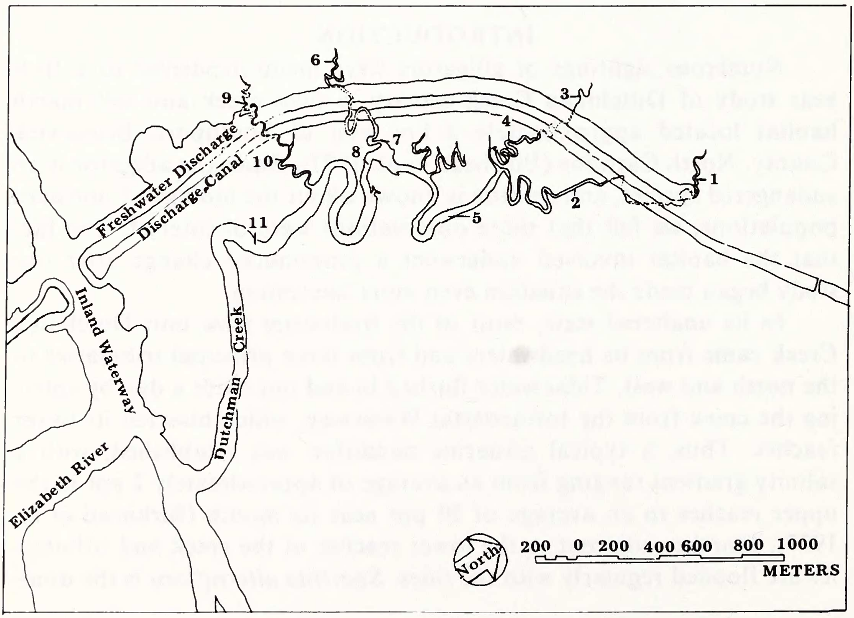

Fig. 1. Map of Dutchman Creek estuary with sampling stations.

RESULTS AND DISCUSSION

Although alligators were observed during every month of the year, the majority of sightings (76%) occurred between April and July (Table 1). The few fall and winter sightings were probably of a single alligator that inhabited the upper reaches of Dutchman Creek below the canal rights-of-way in the vicinity of station 2.

Prior to the diversion of the headwaters and principal tributaries of Dutchman Creek (sampling year 1971-72), all alligators sighted were downstream from what were then the proposed canal rights-of-way (Table 2). After the freshwater input was diverted (sampling years 1972-76), alligators virtually disappeared from the lower reaches of Dutchman Creek itself, and the majority of sightings were made in or along the northwestern and western side of the freshwater drainage canal, particularly in the vicinity of the severed headwaters and tributaries. Despite these spatial shifts, alligators appeared to be randomly distributed within the salinity regimes that were present in the estuary before and after alterations were made (Table 3).

Alligator sightings were bimodal with respect to water temperature (Table 3). Although most alligators (67%) were sighted when water temperatures were between 22°C and 30°C, several (26%) were seen when water temperatures were in the teens. The latter observations frequently involved animals that were basking during the spring, a season when air temperatures were undoubtedly higher than water temperatures.

Most of the alligators whose size could be estimated (Table 4) appeared to be between 1 and 2 m total length. The smallest individual seen was about 0.6 m long, while the largest appeared to be in excess of 2.4 m.

Since alligators observed during the course of this study were not marked, long term movements of individual animals could not be ascertained. Nevertheless, our sightings provide evidence for spatial shifts in the population inhabiting the Dutchman Creek estuary following blockage and diversion of its headwaters and principal tributaries. We suggest these reptiles may have moved because they required access to fresh water.

It is well known that tidal creeks and their associated salt marshes are highly productive habitats that serve as nursery areas for large numbers of fishes and shellfishes (Weinstein 1979). However, Chabreck (1971) and Joanen et al. (1971) noted that immature and hatchling alligators that remained under saline conditions for extended periods of time experienced significant weight losses despite the fact that food was, or appeared to be, readily available. Both authors attributed weight loss to reduced food intake. It is entirely possible that estuarine-inhabiting alligators can only make use of this productivity by either allocating their feeding activities to periods of low tide or by hunting in the brackish parts of the estuary where salinities are low and concentrations of

Table 1. Number of monthly alligator sightings made in the Dutchman Creek estuary from September 1971 through August 1976.

Year	S	O	N	D	J	F	M	A	M	Ju	Jy	A	Totals
1971-72							3	3	2	2	5		15
1972-73							1	7	1	4	2		15
1973-74	1	1		2	2			4	3	3	2	2	20
1974-75	1		1					10	1	3	3	2	21
1975-76	1		1			1	2	2	2	4	3		16
Totals	3	1	2	2	2	1	6	26	9	16	15	4	87

Table 2. Number of alligators sighted per trip in the Dutchman Creek estuary from September 1971 through August 1976. S = number of sightings, T = number of trips, S/T = sightings per trip.

	Tributaries above canal rights-of-way, or freshwater drainage canal (Stations 1,3,6,9)			Tributaries below canal rights-of-way (Stations 2,4,7,10)			Dutchman Creek (Stations 5,8,11)		
	S	T	S/T	S	T	S/T	S	T	S/T
1971-72	0	16	0.00	6	16	0.38	9	30	0.30
1972-73	7	25	0.28	5	36	0.14	3	44	0.07
1973-74	12	27	0.44	6	26	0.23	2	36	0.06
1974-75	16	27	0.59	3	33	0.09	1	39	0.02
1975-76	12	18	0.67	3	16	0.19	1	22	0.04

Table 3. Number of alligator sightings made at various salinities and temperatures in the Dutchman Creek estuary from September 1971 through August 1976.

Salinity (ppt)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30	32	Totals
1971-72	1		1		2		2	2	2	1		1	1					1			1													15
1972-73						1	4		1				2		1		1	1	2		1													14
1973-74	2		1							1			1	1	2	1		2	2					1		1		1	2	1	1			20
1974-75					1		2	1		4	1		1	1			3			2	1		1		1			1	1					21
1975-76	2		2	1		1			1								1		1			2	4			1								16
Totals	5		4	1	3	2	8	3	4	5	2	1	4	2	2	2	6	4	5	2	3	2	5	1	1	2		2	3	1	1			86

Temperature (°C)

	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Totals
Totals	1		2	2	3	3	3	9	1	1	1	7	5	10	8	2	7	8	8	3		2	86

Table 4. Estimated lengths of alligators sighted in Dutchman Creek estuary from September 1971 through August 1976.

	Length				
	<1 m	1-2 m	>2 m	Undetermined	Totals
1971-72		7		8	15
1972-73		10	2	3	15
1973-74	1	17		2	20
1974-75	2	13		6	21
1975-76		7	3	6	16
Totals	3	54	5	25	87

fish and shellfish are relatively high. In keeping with this hypothesis, the alligators that we observed in the lower reaches of the Dutchman Creek estuary in the first year of study (1971-72) may have been only temporary inhabitants whose presence was due to a plentiful food supply.

Another reason for the distributional shift may be related to nesting requirements. Joanen (1969) found that most alligators on the Rockefeller Refuge in coastal Louisiana nested in natural marsh consisting primarily of wiregrass, *Spartina patens.* Salinities in these marshes averaged 3.8 ppt. No nests were transected in the more saline marsh type (Joanen et al. 1971). When questioned as to where estuarine-inhabiting alligators in the vicinity of Southport nested, long-time residents invariably stated that nesting occurred along the upper reaches of estuarine tributaries in a narrow zone characterized by freshwater marsh vegetation. Because this type of habitat was not sampled in our study in the Dutchman Creek estuary, such statements could not be verified for North Carolina. This kind of marsh, although limited in extent, would seem to be a more favorable nesting habitat than the salt marsh proper, where the danger of inundation during storm tides would undoubtedly be greater. In support of this belief is the observation that nearly all juvenile (< 1 m) alligators seen in the vicinity of Southport were in freshwater habitats. At one locality in particular, one of us (WSB) repeatedly saw several alligators as small as 0.5 m long in a shallow freshwater impoundment created by diking off approximately 10 ha of saltmarsh adjacent to a tidal creek about 6 km north-northeast of Southport.

The number of alligators sighted in the Dutchman Creek estuary during the 5-year study remained relatively constant from year to year despite a major alteration in their habitat. However, continued survival of individuals now inhabiting the freshwater drainage canal could be jeopardized because this canal has made their habitat more accessible to humans.

ACKNOWLEDGMENTS.— We sincerely appreciate the efforts of several technicians, particularly J. Lee, D. Herring, L. Hall and J. Schneider who assisted us in the field, and Thomas Sanders who reviewed an early draft of the manuscript. Our studies of the Dutchman Creek estuary were supported by Carolina Power and Light Company, Raleigh, North Carolina.

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Accepted 29 July 1981